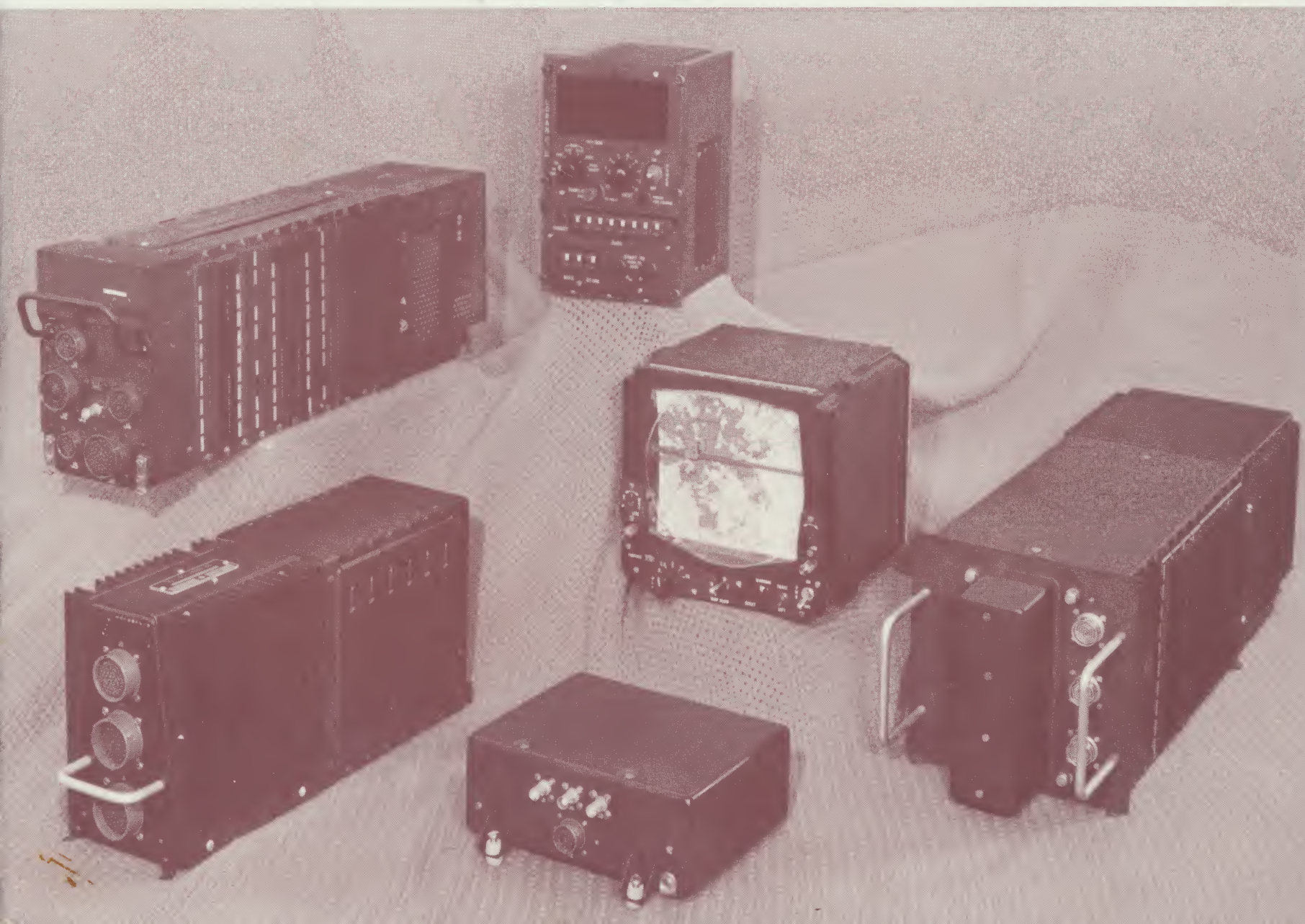


SPERRY LORAN NAVIGATION SET AN/ARN-85



LORAN-C/D RECEIVING SET AN/ARN-85

The AN/ARN-85 Loran-C/D digital microcircuit receiver is an adaptation of the AN/ARN-78 Loran-C receiver. The AN/ARN-85 provides the full Loran-C capability of the standard AN/ARN-78, plus the capability of operating with Loran-D signals.

The receiver can operate either independently to provide standard outputs in hyperbolic time-difference coordinates, or in conjunction with the AN/ARN-85 computer to provide compatible aircraft position information plus guidance dis-

plays of latitude-longitude, range-bearing, or track-cross-track.

The receiver is:

- The first Loran-D receiver
- The first application of microcircuitry to airborne and ground electronic systems
- Fully automatic with only six basic operator controls
- Only one-half the weight and one-third the size of its Loran-C counterpart.

AN/ARN-85 FUNCTION AND UNITS

The AN/ARN-85 uses time-shared radio signals from the three transportable transmitting complexes (AN/TRN-21) together with externally derived navigation information from doppler, inertial, or heading/air speed sources. It consists of five basic units, plus antenna and antenna coupler. In aircraft installations, it operates in conjunction with a standard Remote Attitude Director Indicator and Horizontal Situation Indicator (RADI and HSI). For ground vehicle installations, the RADI and HSI are not used.

RECEIVER R-1367/ARN-85 AND ANTENNA COUPLER CU-1462/ARN-85

The receiver, with antenna and antenna coupler, auto-

matically acquires, tracks, and measures the hyperbolic time differences of the Loran-C/D signals while automatically rejecting jamming and interference.

CONTROL INDICATOR C-6727/ARN-85

The control indicator permits operator control of all functions of the AN/ARN-85. Its controls are used to select the desired display and target/destination. It is also used to insert data into the computer, such as revised destinations or even the programming of an entire Loran-C/D chain. In ground vehicle installations (no RADI or HSI), it displays present position and guidance data.

INDICATOR COUPLER C-1461/ARN-85

The indicator coupler is the buffer between the computer and the display units. It converts digital signals to analog and vice versa for compatible presentations.

SPECIFICATIONS

receiver, control indicator, and couplers

Military Specifications: Meets all Loran-C requirements of MIL-R-38327 (USAF) and Bureau of Naval Weapons Specification XAV-99; Loran-C/D requirements of Exhibit SEAGN No. 64-1, and MIL-E-5400 Class I

Frequency: 100 kc

Signals: 8-pulse Loran-C group or 16-pulse Loran-D group

Bandwidth: 23 kc at -3 db (Loran-C)
16 kc at -3 db (Loran-D)

Receiver Sensitivity: Minimum signal level 5 μ volts at antenna of 100 μ f

Receiver Accuracy: Static and tracking; 0.1 μ sec, Loran-C; 0.05 μ sec, Loran-D. Readout resolution: 0.025 μ sec

Signal-To-Noise: Fully automatic operation consistently maintained under signal-to-noise conditions as low as 1/10

Automatic Anti-Jam: Fully automatic operation consistently maintained with c-w interference up to 35 db greater than received Loran-C signal. Dual automatic notch filter

AGC and Gain Balance Range: 132 db

Automatic Search Time: 20 seconds minimum
10 minutes maximum
1 minute average

Maneuver Settling Time: 30 seconds without velocity aid from computer. Reduced with velocity aid

Antenna: Minimum effective height of less than 15 inches and capacitance of 100 μ f minimum

Velocity: 0 to 2000 knots

Power: 28 volts dc, 180 watts nominal. Optional operation: 115-v, 400-cps, 3-phase, 180 watts; 28 vdc 12 watts

Circuitry: Microcircuits, 95 percent of total circuits; cordwood circuits, 5 percent

Inherent Reliability: Predicted MTBF — in excess of 1050 hours (including automatic notch filter)

Dimensions:

- | | |
|------------------------------|-----------------------------|
| • Loran-C/D Receiver | • Control Indicator |
| Width — $4\frac{7}{8}$ in. | Width — $5\frac{3}{4}$ in. |
| Height — $7\frac{5}{8}$ in. | Height — 9 in. |
| Depth — $22\frac{5}{8}$ in. | Depth — $6\frac{1}{2}$ in. |
| • Antenna Coupler | • Indicator Coupler |
| Width — 8 in. | Width — $4\frac{7}{8}$ in. |
| Height — $3\frac{1}{8}$ in. | Height — $7\frac{5}{8}$ in. |
| Depth — $7\frac{27}{32}$ in. | Depth — $16\frac{1}{4}$ in. |

Weight:

Loran-C/D Receiver	23.7 pounds
Antenna Coupler	4.3 pounds
Control Indicator	9.5 pounds
Indicator Coupler	15 pounds

Volume:

Loran-C/D Receiver	0.422 cubic foot
Antenna Coupler	0.093 cubic foot
Control Indicator	0.194 cubic foot
Indicator Coupler	0.350 cubic foot

SPECIFICATIONS

computer

Number System:	Binary	Military Specifications:	MIL-E-5400, Class I and MIL-I-6181; mounting per MIL-C-172
Word Length:	21 bits, including sign	Control Cycle Time:	18×10^{-6} sec
Radix Point:	Fixed; fractional	Memory Cycle Time:	8×10^{-6} sec
Instruction Type:	Single address	Power:	28 volts dc; 240 watts at 25°C
Negative Number Representation:	2's complement	MTBF:	3500 hours
Clock Rate:	500 kc	Ambient Temperature:	-55°C to +55°C steady state
Command Repertoire:	13 instructions	Dimensions:	Standard 3/4 ATR
Memory:	4096 words; expandable to 6144	Weight:	32 pounds
Operation Rate:	55,500 operations/second; 16,700 multiplies/second	Volume:	0.8 cubic foot

map display

Military Specifications:	MIL-E-5400, Class I	Power:	28 volts dc; 12 amperes
Map Display Surface:	6 inches in diameter	MTBF:	560 hours
Chart Storage:	50 square feet, in 100-foot by 6-inch punch coded roll form	Dimensions:	Width — 8 inches Height — 8 inches Depth — 7 inches
Selectable Chart Scales:	1:2,000,000 20 nm/division 1:1,000,000 10 nm/division 1:500,000 5 nm/division 1:250,000 2.5 nm/division 1:50,000 0.5 nm/division	Weight:	13 pounds
		Volume:	0.259 cubic foot

For Further Information Contact:
INFORMATION AND COMMUNICATIONS DIVISION
SPERRY GYROSCOPE COMPANY DIVISION
SPERRY RAND CORPORATION GREAT NECK, NEW YORK
TELEPHONE: Area Code 516 LR-4-1588



AN/ARN-78

DIGITAL MICROCIRCUIT AIRBORNE LORAN C

RECEIVING SET

SPERRY

- First all solid-state production Loran C receiver
- Lighter weight — less than one-half the weight of any previous receiver
- Smaller size — less than one-third the volume of any existing unit
- Greater reliability — more than five times the reliability of any existing receiver
- Fully automatic — only six basic operator controls

OUTSTANDING FEATURES

Operational

- Microcircuit receiver allows pilot operation.
- Only 15-minute operator training required.
- Simple operation — six operational controls replace up to 26 controls in previous Loran C receivers.
- No oscilloscope required for signal recognition.
- A simple, direct, time difference display provides complete numerical readout in in-line decimal form. No need for operator to resolve cycle-envelope discrepancy indications of previous Loran C receivers.
- A single time difference display automatically time shared between A and B slave presentations eliminates the need for manual switching by the operator and simplifies the receiver control.
- The display maintains readout of fixed time difference numbers long enough for easy operator recognition despite time difference variation due to moving aircraft and effects of noise on the signals.
- Fully automatic search of less than one-minute duration under signal-to-noise conditions of 1:1 or better is provided.
- No acoustical noise. No motors and cooling fans are used.

- Receiver automatically adjusts its mode of operation based on the characteristics of received signals, ambient noise, and vehicle acceleration.

- Tracking capability up to Mach 3

Maintainability

- Malfunction isolation capability — designed for fault isolation with programmed testing.
- Plug-in cards allow quick replacement.
- Individually replaceable microcircuits for minimum cost.
- Minimum spares required — only five types of integrated microcircuits used.
- Alignment simplicity — only ten percent of the alignment controls required by previous receivers.
- No mechanical alignments — no gears, motors, or synchros used. No motors and cooling fans are used.

Reliability

- Inherent MTBF in excess of 1500 hours, more than five times that of previous receivers.
- Low-power-level digital microcircuits and solid-state devices used — no vacuum tubes.
- No moving parts — all-electronic receiver.
- Designed for vibration isolation and line voltage transient protection.



COIN



AEW



ASW



MATS

ES FOR LORAN C

OPTIONAL FEATURES

- Mach 3 capability can be included within the basic configuration.
- Loran D capability can be included to provide operation from Loran D as well as Loran C chains.
- Manual notch filter may be substituted for automatic notch filter to achieve specific frequency rejection.
- Remote indicator can be included to provide a remote time difference presentation.
- Tie-in capabilities can provide AN/ARN-78 operation with navigational computers, coordinate converters, or remote recorders.

Installation

- Small size — less than 0.6 cubic foot — and low weight of less than 35 pounds.
- Small receiver control — 0.05 cubic foot — allows easy installation in cockpit of even single-seat aircraft.
- Small flange-mounted control panels (per MIL C-6781) occupy minimum area on pilot or navigator instrument panel.
- Choice of installation configuration made possible by mounting receiver and indicator controls either adjacent to or remote from main receiver.
- Main receiver unit form factor and mounting in conformance with MIL C-172.
- Utilizes antenna with a minimum effective height of 15 inches and capacitance of 100 μf .
- Low total input power requirement, less than 155 watts.
- Capable of accepting range of input voltage conditions per MIL-STD-704.
- Input power connections per MS-25245.
- Custom design of receiver control and indicator control available.



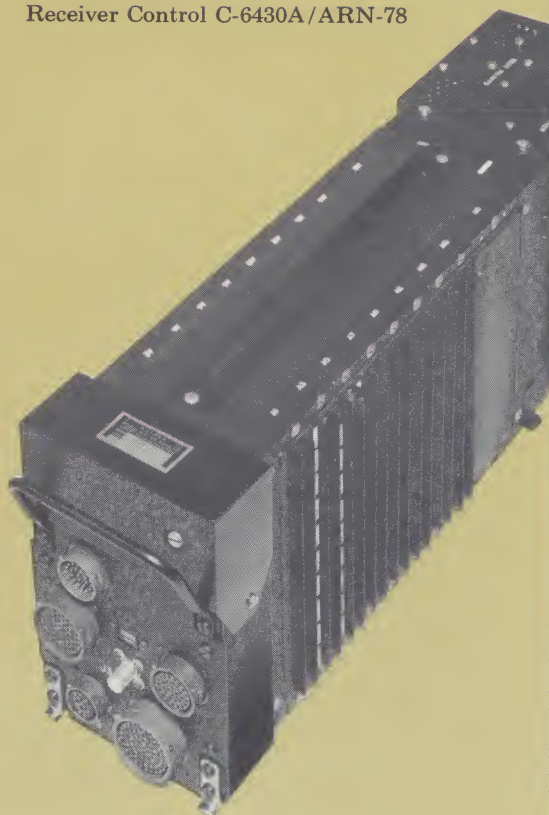
Antenna Coupler CU-1390/ARN-78



Indicator Control C-6431/ARN-78



Receiver Control C-6430A/ARN-78



Loran Receiver R-1298A/ARN-78

Specifications

Frequency: 100 kc

Bandwidth: 23 kc at -3 db

Receiver Sensitivity: Nominal signal level
5 microvolts at antenna of 100 μf

Receiver Accuracy: Static and tracking
 ± 0.1 microsecond

Signal-To-Noise: Fully automatic operation consistently maintained under signal-to-noise conditions as low as 1/10

Automatic Anti-Jam: Fully automatic operation consistently maintained with c-w interference up to 35 db greater than received Loran C signal

Agc and Gain Balance Range: 132 db

Automatic Search Time:
20 seconds minimum
10 minutes maximum
1 minute average

Maneuver Settling Time: 30 seconds

Antenna: Minimum effective height of not less than 15 inches and capacitance of 100 μf .

Velocity: 0 to 2000 knots

Power: 105 to 125 volts ac, 3-phase, nominal
115 volts, 380 to 420 cps; 143 watts maximum; and 28 volts dc, 12 watts maximum

Circuitry: Microcircuits, 95 percent of total circuits; cordwood circuits, 5 percent

Military Specifications: Meets all requirements of MIL-R-38327 (USAF), Bureau of Naval Weapons specification XAV-99, and MIL-E-5400 Class I

Inherent Reliability:
Predicted MTBF - in excess of 1500 hours (including automatic notch filter)
maximum specified ambient temperature

Dimensions:
Receiver Control
Width - 5 $\frac{3}{4}$ inches
Height - 6 inches
Depth - 2 $\frac{9}{16}$ inches

Indicator Control
Width - 5 $\frac{3}{4}$ inches
Height - 2 $\frac{5}{8}$ inches
Depth - 2 $\frac{37}{64}$ inches

Loran Receiver
Width - 4 $\frac{29}{32}$ inches
Height - 7 $\frac{7}{8}$ inches
Depth - 22 $\frac{1}{2}$ inches

Antenna Coupler
Width - 8 inches
Height - 3 $\frac{1}{4}$ inches
Depth - 7 $\frac{27}{32}$ inches

Weight:

Receiver Control	2.9 pounds
Indicator Control	0.9 pound
Loran Receiver	26.5 pounds
Antenna Coupler	4.0 pounds
TOTAL	34.3 pounds

Volume:

Receiver Control	0.050 cubic foot
Indicator Control	0.022 cubic foot
Loran Receiver	0.422 cubic foot
Antenna Coupler	0.093 cubic foot
TOTAL	0.587 cubic foot

For Further Information Contact:

INFORMATION AND COMMUNICATIONS DIVISION

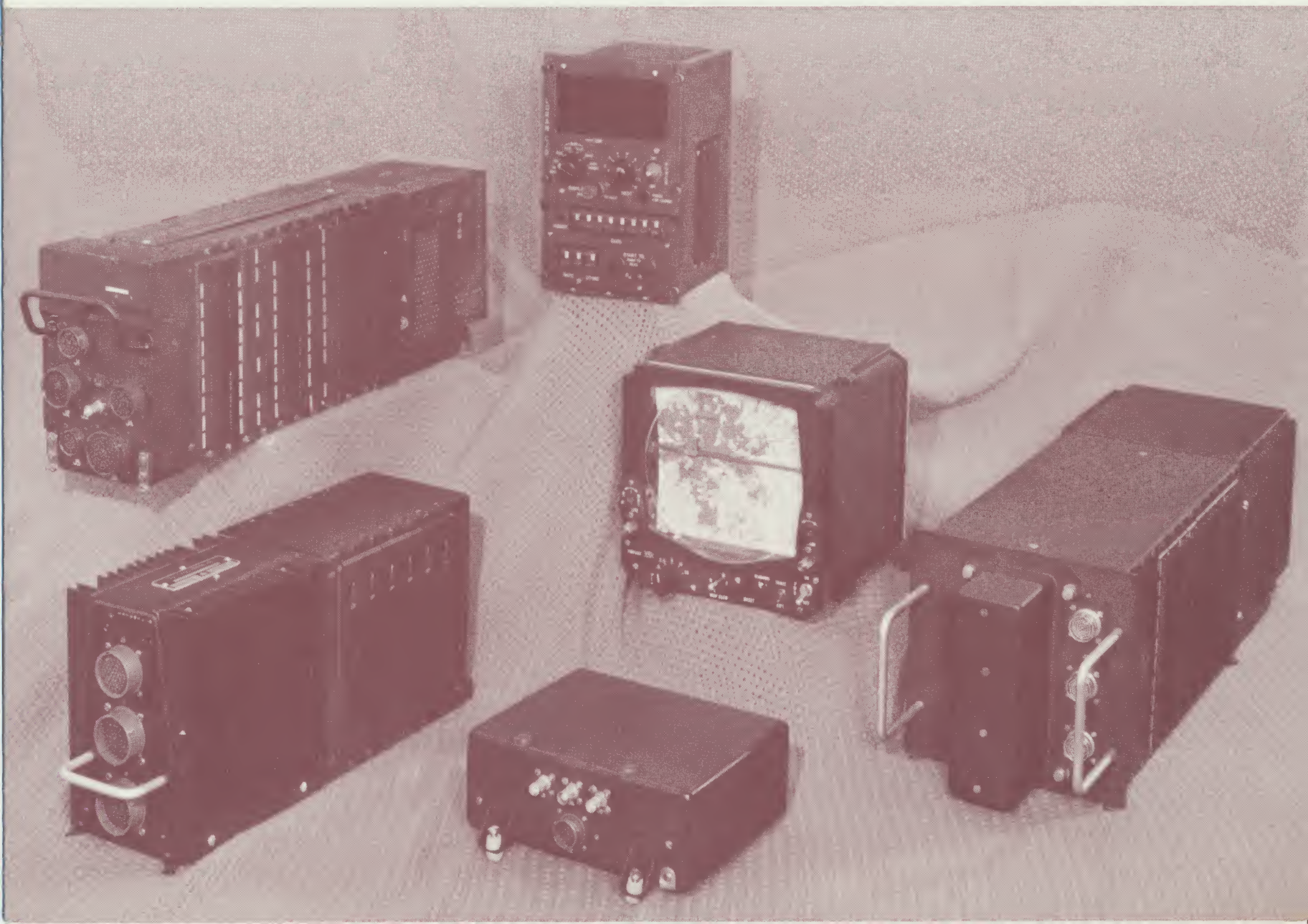
Sperry Gyroscope Company

DIVISION OF SPERRY RAND CORPORATION

GREAT NECK, NEW YORK

TELEPHONE: Area Code 516 LR 4-1009

SPERRY LORAN NAVIGATION SET AN/ARN-85



LORAN-C/D RECEIVING SET AN/ARN-85

The AN/ARN-85 Loran-C/D digital microcircuit receiver is an adaptation of the AN/ARN-78 Loran-C receiver. The AN/ARN-85 provides the full Loran-C capability of the standard AN/ARN-78, plus the capability of operating with Loran-D signals.

The receiver can operate either independently to provide standard outputs in hyperbolic time-difference coordinates, or in conjunction with the AN/ARN-85 computer to provide compatible aircraft position information plus guidance dis-

plays of latitude-longitude, range-bearing, or track-cross-track.

The receiver is:

- The first Loran-D receiver
- The first application of microcircuitry to airborne and ground electronic systems
- Fully automatic with only six basic operator controls
- Only one-half the weight and one-third the size of its Loran-C counterpart.

AN/ARN-85 FUNCTION AND UNITS

The AN/ARN-85 uses time-shared radio signals from the three transportable transmitting complexes (AN/TRN-21) together with externally derived navigation information from doppler, inertial, or heading/air speed sources. It consists of five basic units, plus antenna and antenna coupler. In aircraft installations, it operates in conjunction with a standard Remote Attitude Director Indicator and Horizontal Situation Indicator (RADI and HSI). For ground vehicle installations, the RADI and HSI are not used.

RECEIVER R-1367/ARN-85 AND ANTENNA COUPLER CU-1462/ARN-85

The receiver, with antenna and antenna coupler, auto-

matically acquires, tracks, and measures the hyperbolic time differences of the Loran-C/D signals while automatically rejecting jamming and interference.

CONTROL INDICATOR C-6727/ARN-85

The control indicator permits operator control of all functions of the AN/ARN-85. Its controls are used to select the desired display and target/destination. It is also used to insert data into the computer, such as revised destinations or even the programming of an entire Loran-C/D chain. In ground vehicle installations (no RADI or HSI), it displays present position and guidance data.

INDICATOR COUPLER C-1461/ARN-85

The indicator coupler is the buffer between the computer and the display units. It converts digital signals to analog and vice versa for compatible presentations.

SPECIFICATIONS

receiver, control indicator, and couplers

Military Specifications: Meets all Loran-C requirements of MIL-R-38327 (USAF) and Bureau of Naval Weapons Specification XAV-99; Loran-C/D requirements of Exhibit SEAGN No. 64-1, and MIL-E-5400 Class I

Frequency: 100 kc

Signals: 8-pulse Loran-C group or 16-pulse Loran-D group

Bandwidth: 23 kc at -3 db (Loran-C)
16 kc at -3 db (Loran-D)

Receiver Sensitivity: Minimum signal level 5 μ volts at antenna of 100 μ f

Receiver Accuracy: Static and tracking; 0.1 μ sec, Loran-C; 0.05 μ sec, Loran-D. Readout resolution: 0.025 μ sec

Signal-To-Noise: Fully automatic operation consistently maintained under signal-to-noise conditions as low as 1/10

Automatic Anti-Jam: Fully automatic operation consistently maintained with c-w interference up to 35 db greater than received Loran-C signal. Dual automatic notch filter

AGC and Gain Balance Range: 132 db

Automatic Search Time: 20 seconds minimum
10 minutes maximum
1 minute average

Maneuver Settling Time: 30 seconds without velocity aid from computer. Reduced with velocity aid

Antenna: Minimum effective height of less than 15 inches and capacitance of 100 μ f minimum

Velocity: 0 to 2000 knots

Power: 28 volts dc, 180 watts nominal. Optional operation: 115-v, 400-cps, 3-phase, 180 watts; 28 vdc 12 watts

Circuitry: Microcircuits, 95 percent of total circuits; cordwood circuits, 5 percent

Inherent Reliability: Predicted MTBF — in excess of 1050 hours (including automatic notch filter)

Dimensions:

- | | |
|------------------------------|-----------------------------|
| • Loran-C/D Receiver | • Control Indicator |
| Width — $4\frac{7}{8}$ in. | Width — $5\frac{3}{4}$ in. |
| Height — $7\frac{5}{8}$ in. | Height — 9 in. |
| Depth — $22\frac{5}{8}$ in. | Depth — $6\frac{1}{2}$ in. |
| • Antenna Coupler | • Indicator Coupler |
| Width — 8 in. | Width — $4\frac{7}{8}$ in. |
| Height — $3\frac{1}{8}$ in. | Height — $7\frac{5}{8}$ in. |
| Depth — $7\frac{27}{32}$ in. | Depth — $16\frac{1}{4}$ in. |

Weight:

Loran-C/D Receiver	23.7 pounds
Antenna Coupler	4.3 pounds
Control Indicator	9.5 pounds
Indicator Coupler	15 pounds

Volume:

Loran-C/D Receiver	0.422 cubic foot
Antenna Coupler	0.093 cubic foot
Control Indicator	0.194 cubic foot
Indicator Coupler	0.350 cubic foot

SPECIFICATIONS

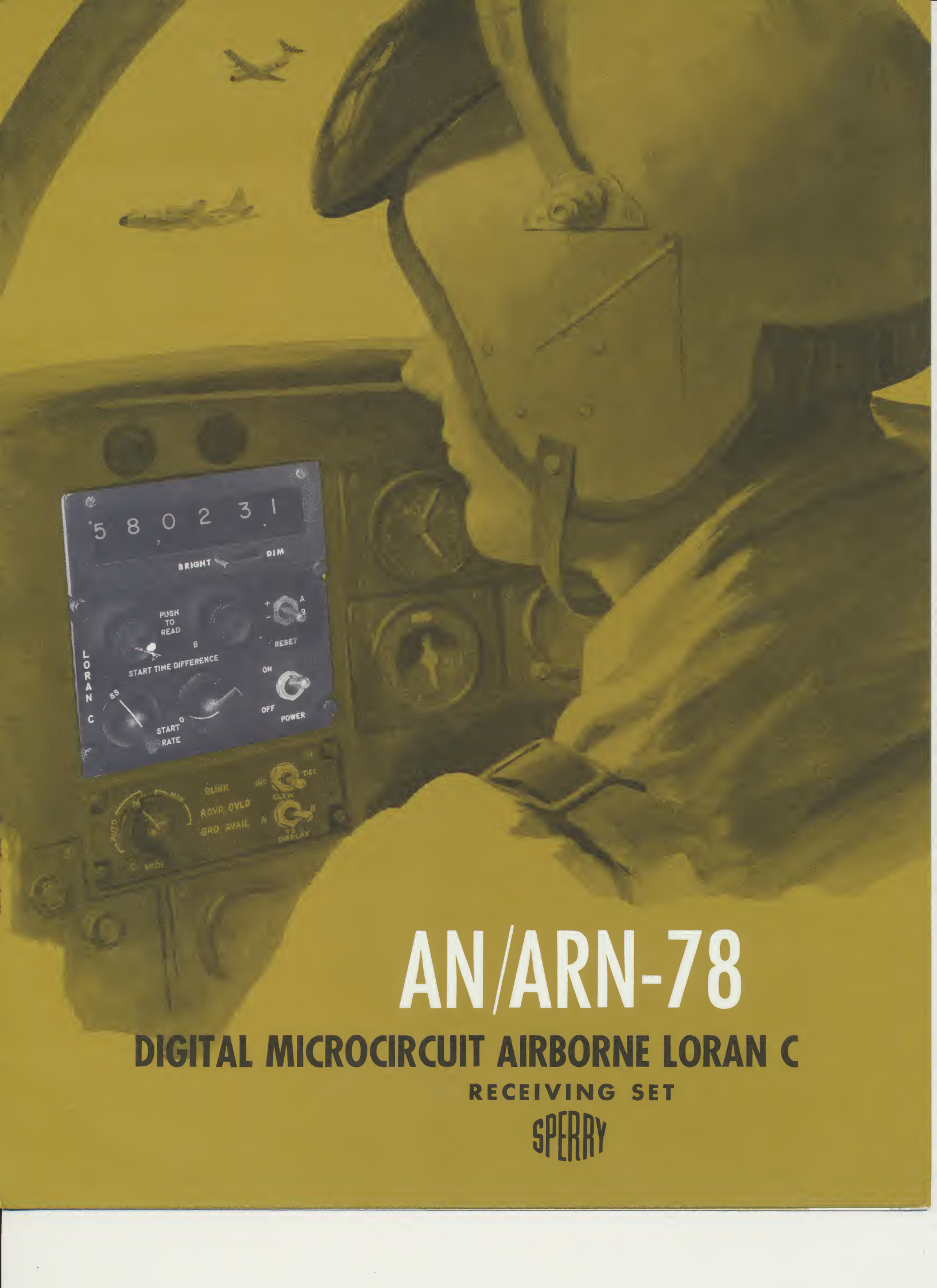
computer

Number System:	Binary	Military Specifications:	MIL-E-5400, Class I and MIL-I-6181; mounting per MIL-C-172
Word Length:	21 bits, including sign	Control Cycle Time:	18×10^{-6} sec
Radix Point:	Fixed; fractional	Memory Cycle Time:	8×10^{-6} sec
Instruction Type:	Single address	Power:	28 volts dc; 240 watts at 25°C
Negative Number Representation:	2's complement	MTBF:	3500 hours
Clock Rate:	500 kc	Ambient Temperature:	-55°C to +55°C steady state
Command Repertoire:	13 instructions	Dimensions:	Standard ¾ ATR
Memory:	4096 words; expandable to 6144	Weight:	32 pounds
Operation Rate:	55,500 operations/second; 16,700 multiplies/second	Volume:	0.8 cubic foot

map display

Military Specifications:	MIL-E-5400, Class I	Power:	28 volts dc; 12 amperes
Map Display Surface:	6 inches in diameter	MTBF:	560 hours
Chart Storage:	50 square feet, in 100-foot by 6-inch punch coded roll form	Dimensions:	Width — 8 inches Height — 8 inches Depth — 7 inches
Selectable Chart Scales:	1:2,000,000 20 nm/division 1:1,000,000 10 nm/division 1:500,000 5 nm/division 1:250,000 2.5 nm/division 1:50,000 0.5 nm/division	Weight:	13 pounds
		Volume:	0.259 cubic foot

For Further Information Contact:
INFORMATION AND COMMUNICATIONS DIVISION
SPERRY GYROSCOPE COMPANY DIVISION
SPERRY RAND CORPORATION GREAT NECK, NEW YORK
TELEPHONE: Area Code 516 LR-4-1588



AN/ARN-78

DIGITAL MICROCIRCUIT AIRBORNE LORAN C

RECEIVING SET

SPERRY

- First all solid-state production Loran C receiver
- Lighter weight — less than one-half the weight of any previous receiver
- Smaller size — less than one-third the volume of any existing unit
- Greater reliability — more than five times the reliability of any existing receiver
- Fully automatic — only six basic operator controls

OUTSTANDING FEATURES

Operational

- Microcircuit receiver allows pilot operation.
- Only 15-minute operator training required.
- Simple operation — six operational controls replace up to 26 controls in previous Loran C receivers.
- No oscilloscope required for signal recognition.
- A simple, direct, time difference display provides complete numerical readout in in-line decimal form. No need for operator to resolve cycle-envelope discrepancy indications of previous Loran C receivers.
- A single time difference display automatically time shared between A and B slave presentations eliminates the need for manual switching by the operator and simplifies the receiver control.
- The display maintains readout of fixed time difference numbers long enough for easy operator recognition despite time difference variation due to moving aircraft and effects of noise on the signals.
- Fully automatic search of less than one-minute duration under signal-to-noise conditions of 1:1 or better is provided.
- No acoustical noise. No motors and cooling fans are used.

- Receiver automatically adjusts its mode of operation based on the characteristics of received signals, ambient noise, and vehicle acceleration.

- Tracking capability up to Mach 3

Maintainability

- Malfunction isolation capability — designed for fault isolation with programmed testing.
- Plug-in cards allow quick replacement.
- Individually replaceable microcircuits for minimum cost.
- Minimum spares required — only five types of integrated microcircuits used.
- Alignment simplicity — only ten percent of the alignment controls required by previous receivers.
- No mechanical alignments — no gears, motors, or synchros used. No motors and cooling fans are used.

Reliability

- Inherent MTBF in excess of 1500 hours, more than five times that of previous receivers.
- Low-power-level digital microcircuits and solid-state devices used — no vacuum tubes.
- No moving parts — all-electronic receiver.
- Designed for vibration isolation and line voltage transient protection.



COIN



AEW



ASW



MATS

Specifications

Frequency: 100 kc

Bandwidth: 23 kc at -3 db

Receiver Sensitivity: Nominal signal level
5 microvolts at antenna of 100 $\mu\mu\text{f}$

Receiver Accuracy: Static and tracking
 ± 0.1 microsecond

Signal-To-Noise: Fully automatic operation consistently maintained under signal-to-noise conditions as low as 1/10

Automatic Anti-Jam: Fully automatic operation consistently maintained with c-w interference up to 35 db greater than received Loran C signal

Agc and Gain Balance Range: 132 db

Automatic Search Time:
20 seconds minimum
10 minutes maximum
1 minute average

Maneuver Settling Time: 30 seconds

Antenna: Minimum effective height of not less than 15 inches and capacitance of 100 $\mu\mu\text{f}$.

Velocity: 0 to 2000 knots

Power: 105 to 125 volts ac, 3-phase, nominal 115 volts, 380 to 420 cps; 143 watts maximum; and 28 volts dc, 12 watts maximum

Circuitry: Microcircuits, 95 percent of total circuits; cordwood circuits, 5 percent

Military Specifications: Meets all requirements of MIL-R-38327 (USAF), Bureau of Naval Weapons specification XAV-99, and MIL-E-5400 Class I

Inherent Reliability:
Predicted MTBF - in excess of 1500 hours (including automatic notch filter)
maximum specified ambient temperature

Dimensions:
Receiver Control
Width - $5\frac{3}{4}$ inches
Height - 6 inches
Depth - $2\frac{9}{16}$ inches

Indicator Control
Width - $5\frac{3}{4}$ inches
Height - $2\frac{3}{8}$ inches
Depth - $2\frac{37}{64}$ inches

Loran Receiver
Width - $4\frac{29}{32}$ inches
Height - $7\frac{7}{8}$ inches
Depth - $22\frac{5}{8}$ inches

Antenna Coupler
Width - 8 inches
Height - $3\frac{1}{4}$ inches
Depth - $7\frac{27}{32}$ inches

Weight:

Receiver Control	2.9 pounds
Indicator Control	0.9 pound
Loran Receiver	26.5 pounds
Antenna Coupler	4.0 pounds
TOTAL	34.3 pounds

Volume:

Receiver Control	0.050 cubic foot
Indicator Control	0.022 cubic foot
Loran Receiver	0.422 cubic foot
Antenna Coupler	0.093 cubic foot
TOTAL	0.587 cubic foot

For Further Information Contact:

INFORMATION AND COMMUNICATIONS DIVISION

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TELEPHONE: Area Code 516 LR 4-1009